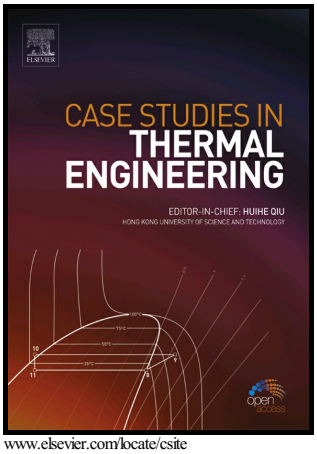
# Author's Accepted Manuscript




www.elsevier.com/locate/csite

Thermal Analysis in Stokes' Second Problem of Nanofluid: Applications in Thermal Engineering

Ilyas Khan, Kashif Ali Abro

PII: S2214-157X(17)30337-4
DOI: https://doi.org/10.1016/j.csite.2018.04.005
Reference: CSITE276

To appear in: *Case Studies in Thermal Engineering*

Received date: 20 December 2017
Revised date: 30 March 2018
Accepted date: 6 April 2018

Cite this article as: Ilyas Khan and Kashif Ali Abro, Thermal Analysis in Stokes' Second Problem of Nanofluid: Applications in Thermal Engineering, *Case Studies in Thermal Engineering,* https://doi.org/10.1016/j.csite.2018.04.005

# Thermal Analysis in Stokes' Second Problem of Nanofluid: Applications in Thermal Engineering

Ilyas Khan[1*], Kashif Ali Abro[2]

[1]Faculty of Mathematics and Statistics, Ton Duc Thang University, Ho Chi Minh City, Vietnam.

[2]Department of Basic Sciences and Related Studies, Mehran University of Engineering Technology, Jamshoro, Pakistan

*Corresponding author: Dr. Ilyas Khan, Faculty of Mathematics and Statistics, Ton Duc Thang University, Ho Chi Minh City, Vietnam. ilyaskhan@tdt.edu.vn

## Abstract

Present study is prepared to analyze the heat transfer for the Stokes' second problem of nanofluid. Water is taken as base fluid and two types of nanoparticles namely copper $(Cu)$ and silver $(Ag)$ are suspended in it. Exact solutions for velocity field and temperature distribution have been investigated by utilizing the Laplace transform method and presented in the form simple elementary functions. The results lead to the few facts regarding the effects of rheological and pertinent parameters on the graphical illustrations. Heat transfer is decreased with increasing nanoparticles volume fraction. Hartman number and porosity have opposite effects on fluid motion. This study has several applications in thermal engineering.

**Key word:** Copper $(Cu)$ and silver $(Ag)$; Water; Stokes second problem; Heat transfer

**Nomenclatures:**

| | |
|---|---|
| $F$ | Velocity field |
| $\Omega$ | Non-zero constant |
| $\omega$ | Frequency of the oscillation |
| $\mu_{nf}$ | Dynamic viscosity |
| $\phi_1$ | Porosity |
| $\rho_f$ | Viscosity of the fluid fraction |
| $\xi$ | Spatial variable |
| $M$ | Magnetic parameter |
| $\tau$ | Time |
| $Ha$ | Hartman number |
| $k$ | Permeability of porous medium |